DOCUMENT RESUME

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ABSTRACT

One of a series of pre-apprenticeship phase 1 training modules dealing with math skills, this self-paced student module covers the addition and subtraction of common fractions and mixed numbers. Included in the module are the following: cover sheet listing module title, goals, and performance indicators; introduction; study guide/check list with directions for module completion; information sheet; self-assessment; self-assessment answers; and post assessment. Emphasis of the module is on computation of math problems typically encountered by workers in the skilled trades. (Other related pre-apprenticeship phase 1 training modules are available separately--see note.) (MN)

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INDIVIDUALIZED LEARNING SYSTEMS

PRE-APPRENTICESHIP PHASE 1 TRAINING

MATH

ADDITION & SUBTRACTION OF COMMON FRACTIONS AND MIXED NUMBERS

CE03792

Goal:

The student will know the necessary math concepts in the addition and subtraction of common fractions and mixed numbers to enable him or her to compute math problems in which these concepts are used.

Performance Indicators:

Given a series of math problems in the Self Assessment and Post Assessment portions of this module, the student will be able to successfully compute the answers.

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Introduction

In solving the many kinds of mathematical problems that are encountered in the skilled trades, the mechanic will often find it necessary to work with fractions as well as whole numbers. The Information section for this topic introduces common fractions--fractions in which both the numerator and the denominator are expressed, as in 1/4, 3/8, or 11/32--and includes practice problems in the addition and subtraction of common fractions and mixed numbers (numbers that consist of whole numbers and fractions).

Study Guide

This study guide is designed to help you successfully complete this module. Check off the following steps to completion as you finish them.

STEPS TO COMPLETION

1. ____ Familiarize yourself with the Goal and Performance Indicators on the title page of this module.

2. ____ Read the Introduction and study the Information section of the module. It is intended to provide you with the math skills necessary to successfully complete the assessment portions.

3. ____ Complete the Self Assessment section of this module. You may refer to the Information section for help.

4. ____ Compare your Self Assessment answers with the correct answers on the Self Assessment Answer Sheet immediately following the Self Assessment exam. If you missed more than one of the Self Assessment exam questions, bo back and re-study the necessary portions of the Information section, or ask your instructor for help. If you missed one or none of these problems, go on to step 5.

5. ____ Complete the Post Assessment section of the module. Show your answers to the instructor. It is recommended that you score 90% or better on those Post Assessment exams with 10 or more problems, or miss no more than one problem on those with fewer than 10 problems, before being allowed to go on the next math module.

Information

FRACTIONS

A fraction is one or more parts of a whole. Fractions are written with one number over the other (1/2 or 1/4 or 3/4).

The top number is called the NUMERATOR and the bottom number is called the DENOMINATOR. The denominator identifies the number of parts into which the whole is divided. The numerator indicates the number of parts of the whole which is of concern. In reading a fraction, the top number is always read first. For example, 1/2 would be read "one half"; and 3/4 would be read "three fourths" and 3/8 would be read "three eighths."

A fraction should always be reduced to its lowest denominator. For instance, 3/2 is not in correct form. It should be 1 1/2 because 2/2 = 1 and 1 + 1/2 = 1 1/2. The 1 1/2 is called a MIXED NUMBER. Always when the numerator and denominator are the same number as 1/1, 2/2, 3/3, etc. they are equal to 1.

ADDING FRACTIONS

The easiest fractions to add are those whose denominators (bottom numbers) are the same, as 1/8 + 3/8. Simply add the numerators (top numbers) together and keep the same denominator. For example, 1/8 + 3/8 = 4/8 or 1/2. (Reducing the fraction to its lowest denominator is preferred.) Another example of reducing to the lowest denominator is 8/24 = 1/3, because 24 may be divided by 8 three times.

When fractions to be added have different denominators (bottom numbers), multiply both numerator and denominator of each fraction by a number that will make the denominators equal. For example: 1/3 + 3/5 = 5/15 + 9/15. Observation indicated that 15 was the smallest number that could be divided evenly by both denominators. To complete the example, 5/15 + 9/15 = 14/15. Therefore, the sum of 1/3 and 3/5 is 14/15.

PROBLEMS IN ADDING FRACTIONS

What is the height of one stretcher course of brick if the brick are 2 1/4 in. high and the mortar joint is 3/8 in?

Answers: 2 1/4 + 3/8 = 2 2/8 + 3/8 = 2 5/8 in. height for one course

A mason estimated the following amounts of mortar required for a job: 5 1/2 cu. yd., 11 1/3 cu. yd. and 6 1/4 cu. yd. What is total amount of mortar required for job?

Answer: 5 1/2 + 11 1/2 + 6 1/4

= 5 6/12 + 11 4/12 + 6 3/12

= 22 13/12 = 23 1/12 cu. yd. of mortar

SUBTRACTING FRACTIONS

Change all fractions to the same common denominator as was done for adding fractions. When the denominators are the same, subtract the numerators.

Self Assessment

Note: The value of a fraction is not changed when both the numerator and denominator are multiplied or divided by the same number.

Reduce to halves. (A denominator of 2)

4/8 = ___ 8/16 = ___ 16/8 = ___

Reduce to 8ths.

4/16 = ___ 16/32 = ___ 32/64 = ___

Note: Divide the numerator and denominator by the same number. When both the numerator and the denominator cannot be divided further by the same number, the fraction is expressed in its lowest terms.

Reduce to lowest terms:

4/16 = ___ 14/16 = ___ 28/64 = ___ 16/32 = ___ 12/16 = ___ 24/12 = ___

Note: To reduce an improper fraction (where the numerator is larger than the denominator) to its lowest terms, divide the numerator (above the line) by the denominator (below the line).

Reduce the resulting fraction to its lowest terms.

5/2 = ___ 10/3 = ___ 10/5 = ___

Note: To change a mixed fraction to an improper fraction, multiply the denominator by the whole number and add the numerator. Place the result over the denominator.

Change to improper fractions.

1 3/4 = ____ 8 7/8 = ____ 3 1/4 = ____ 10 2/3 = ____

How many eights of an inch are there in each of the following lengths of steel?

1 3/8" = ____ 4 3/8" = ____ 7 3/8" = ____

Note: The smallest number that can be divided by all the denominators is called the LOWEST COMMON DENOMINATOR.
To reduce fractions to the lowest common denominator, divide the number selected as the lowest common denominator by the denominator of each given fraction.
Multiply both the numerator and denominator by this quotient.

Note: To add fractions, change to fractions having a least common denominator. Add the numerators. Write the sum over the common denominator. Reduce the result to its lowest terms.

Addition of common fractions:

1/6 + 5/6 = ____ 1/3 + 1/16 = ____ 5/8 + 3/4 + 3/8 = ____

Addition of common fractions and mixed numbers:

121 + 7 5/12 = ____ 1 17/64 + 1 13/64 + 9/32 = ____

Note: To subtract a fraction from a whole number, take one unit from the whole number and change it into a fraction having the same denominator as the fraction which is to be subtracted. Subtract the numerators of the original fraction from the one unit that was changed to its fractional value. Reduce the resulting fraction to its lowest terms. Place the whole number next to the fraction.

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 4      7
-3/4   -15/16
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Note: To subtract a mixed number from a whole number, borrow one unit from the whole number and change it to a fraction which has the same denominator as the mixed number. Subtract the fraction part of the mixed number from the fraction part of the whole number. Subtract the whole numbers and reduce

the resulting mixed number to lowest terms.

$$\begin{array}{lll} 2 & 3 & 27 \\ -1\ 1/3 & -1\ 3/8 & -1\ 5/16 \end{array}$$

Note: To subtract two mixed numbers, change the fractional part of each mixed number to the least common denominator. Borrow one unit, when necessary, to make up a larger fraction than the one being subtracted. Subtract the fractions first, the whole numbers next, and reduce the result to lowest terms.

Note: To add and subtract fractions in the same problem, change all fractions to the least common denominator. Add or subtract the numerators as required. Reduce the result to lowest terms.

$$\begin{array}{lll} 1\ 3/5 & 7\ 5/6 & 18\ 7/8 \\ -1\ 1/5 & -2\ 1/6 & -9\ 3/8 \end{array}$$

Self Assessment Answers

Reduce to halves: 1/2 1/2 4/2

Reduce to 8ths: 2/8 4/8 4/8

Reduce to lowest terms: 1/4 7/8 7/16 1/2 3/4 2/1

Reduce the resulting fraction to its lowest terms: 2 1/2 3 1/3 2

Change to improper fractions: 7/4 71/8 13/4 32/3

How many eights of an inch are there in each of the following lengths of steel:
11 35 59

Addition of common fractions and mixed numbers: 128 5/12 2 48/64

Post Assessment

Listed below each problem are four possible answers. Decide which of the four is correct, or most nearly correct; then write the letter of that answer in the blank space to the left of the problem.

1. ____ The improper fraction 48/32 expressed as a mixed number is:

   a. 1 15/32
   b. 1 1/2
   c. 1 5/8
   d. 2 1/32

2. ____ The mixed number 4 3/16 expressed as an improper fraction is:

   a. 15/8
   b. 43/16
   c. 67/16
   d. 35/8

3. ____ What is the least common denominator for the following group of fractions: 1/8, 1/2, 1/4 and 1/12

   a. 12
   b. 18
   c. 24
   d. 48

4. ____ What is the sum of the following fractions: 1/2, 1/3, 1/8 and 1/12?

   a. 1 3/12
   b. 1 1/12
   c. 1 1/24
   d. 1 1/48

5. ____ If 1/2 is subtracted from 7/8, the difference is:

   a. 3/8
   b. 5/8
   c. 1 1/8
   d. 1 3/8

6. ____ The sum of 1 1/2, 5/6, 14, and 20 2/3 is:

   a. 36 2/3
   b. 36 17/18
   c. 37
   d. 37 2/9

7. ____ One roof is 1/3 larger in area than another. The smaller roof takes 24 squares of roofing material. How many squares of roofing material will the larger roof take?

   a. 32
   b. 34
   c. 36
   d. 37

8. ____ One-third of a box of glass is needed to glaze the north elevation of a building; 2/3 of a box is needed to glaze the south elevation; 1/6 of a box is needed to glaze the east elevation; and 1/2 of a box is needed to glaze the west elevation. How many boxes are needed to glaze all four elevations?

a. 1 1/6
b. 1 1/3
c. 1 1/2
d. 1 2/3

9. ____ From a bundle containing 101 linear feet of molding, a cabinetmaker uses the following amounts: 11 1/2', 8 3/4', 12 1/8' and 9 5/8'. How many linear feet of molding does he use in all?

a. 38 1/2
b. 39 1/4
c. 39 3/4
d. 41 5/6

10. ____ How many linear feet of molding remain in the bundle in problem 9?

a. 59 1/6
b. 61 1/4
c. 61 3/4
d. 62 1/2

11. ____ From a roll of hanger wire weighing 100 lbs., a lather uses the following amounts: 6 lbs., 18 1/2 lbs., 9 1/8 lbs., and 22 1/4 lbs. How many pounds of the wire does he use in all?

a. 54 1/4
b. 54 3/4
c. 55 1/4
d. 55 7/8